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ABSTRACT

Preadolescents are faced with a variety of pressures, but usually receive little help in stress management from the school. To examine the effects of relaxation training on rural middle school students (N = 532), researchers implemented a daily 15-minute program of relaxation training exercises on aduio tapes in the regular classroom setting. The students recorded their wrist temperatures before and after each exercise as a measure of the relaxation state. Researchers examined five dependent variables and compared the performance of students in the experimental group with a randomized control group. Absenteeism and tardiness showed no significant differences between experimental and control groups. The experimental students, however, had significantly fewer discipline problems than the control group, indicating that relaxation training has a positive effect on problem behavior. Also, while no overall experimental/control difference was found on a measure of self-concept, females in the experimental group did appear to have higher self-concept scores than females in the control group. Finally, while there was no overall difference between the experimental and control groups in achievement, the experimental groups which excelled at relaxing, as measured by wrist temperatures, scored significantly higher than their paired control groups. Experimental groups with poor relaxation skills scored equal to or lower than their control groups. This finding suggests the existence of a threshold of relaxation, a level necessary for cognitive gains. (Author/JAC)

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Research Bulletin No. 34 October, 1984

ACADEMIC AND PSYCHOSOCIAL EFFECTS OF RELAXATION TRAINING ON RURAL PREADOLESCENTS

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ACADEMIC AND PSYCHOSOCIAL EFFECTS OF RELAXATION TRAINING ON RURAL PREADOLESCENTS

by

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The study, known as Project Relaxation, had a small but industrious staff. The school coordinator, Ms. Christine Justice, was invaluable in the coordination of activities in the schools. Mr. Jim Frank Casteel, the evaluator, never complained about the volumes of data for keypunching and analysis. The work of the evaluator was exemplary. Although Dr. Jimmy Quinn worked only occasionally as a consultant to the project, the principal investigator knew that he would be willing to give his expert opinion whenever the study needed it. For his assistance the principal investigator is grateful.

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Abstract

The study examined the effects of a relaxation training program on rural middle school students. Researchers implemented a daily 15-minute program of relaxation training exercises on audio tapes in the regular classroom setting with a heterogeneous sample. The students recorded their wrist temperatures before and after each exercise as a measure of the relaxation state. Researchers examined five dependent variables and compared the performance of students in the experimental group with a randomized control group. Absenteeism and tardiness showed no significant difference between experimental and control groups. The experimental students had significantly fewer discipline problems than the control group, indicating that relaxation training has a positive effect on problem behavior. Also, while no overall experimental/control difference was found on a measure of self-concept, females in the experimental group did appear to have higher self-concept scores than females in the control group. Finally, while there was no overall difference between the experimental and control groups in achievement, the experimental groups which excelled at relaxing, as measured by wrist temperatures, scored significantly higher than their paired control groups. Experimental groups with poor relaxation skills scored equal to or lower than their control groups. This finding suggests the existence of a threshold of relaxation, a level necessary for cognitive gains.

INTRODUCTION

Preadolescent children are faced with a variety of pressures and anxiety-producing adjustments which are caused by such factors as peer pressure, school pressure, technology, changes in the family structure, and changes in the demands and expectations of society. In addition to these pressures felt by all young people, a large percentage of the rural boys and girls in South Carolina face the pressures associated with being "poor." Rural families lack sufficient amounts of money for cultural, educational, and recreational activities to narrow the gap between functioning levels of rural children and their urban counterparts.

Added to outside pressures are internal changes in the physical body which cause stress. At this period, ages 10 to 14, the body is in the process of changing from a child to an adult. Rapid, uneven growth and unstable hormone secretions are characteristic.

The results of the stress-related problems emerge in the children. A general sense of hostility is apparent in the high number of behavioral problems. According to Spencer (1979), on the sharp statistical rise are: teenage and child pregnancy; teenage and child alcoholism; teenage and child prostitution and pornography; teenage and child venereal disease; truancy; illiteracy; and criminality. Suicide is increasing, also. Suicide is the third leading cause of death among youth, preceded only by accidents and murder. These behaviors are symptomatic and may establish life-long patterns of negative response to stressful situations.

The preadolescent has little help from the school in learning to cope with the demands of life. Some authorities (Holland, 1980; Lowenstein and Lowenstein, 1983; Lupin, 1977) recommend the initiation of relaxation training in the school program in order to teach children "self-regulation," a skill thought to be an essential life skill. Moreover, they recommend teaching progressively more sophisticated self-regulation skills throughout the years of schooling.

Research supports the positive effects of relaxation training with children. Studies with hyperactive, learning disabled, and emotionally disturbed children show improvement in self-concept, achievement, distractibility, irritability, explosiveness, aggressivity, and emotionally (Amerikaner and Summerlin, 1982; Braud, 1978; Carter and Synolds, 1974; Carter and Russell, 1981; Dunn and Howell, 1982; Lupin, Braud, Braud, and Duer, 1976; Martin and Hershey, 1976; Moore, 1977; Omizo, 1980; 1982; Palmeri, 1980; Rivera and Omizo, 1980; Simpson and Nelson, 1974; Watson and Hall, 1977). Research with

normative, mainstream children is limited but, in general, concurs with findings from exceptional boys and girls (Harlem, 1975; Jasnow, 1982; Matthews, 1982b).

Since young people appear to need assistance in learning stress management skills in order to manage stress in a positive and constructive manner, the researcher designed the study described in this report. The purpose of the study was to teach a large number of young people the skills of relaxing. have them practice the skill daily for eight months, and then examine the effects of the treatment on academic and psychosocial behavior. In addition to the lifelong skill learned by the boys and girls in the sample, other benefits derived from the study were (1) contributions to the literature on a heterogeneous population of children using relaxation, (2) suggestions for the implementation of a program of relaxation in the regular school program, and (3) guidelines for using wrist temperature as a measure of relaxation.

OBJECTIVES

The study examined the effects of a systematic program of relaxation training on affective and cognitive variables among rural middle school children in the midlands of South Carolina. The researcher observed dependent variables important in the public schools (absenteeism and tardiness, discipline, self-concept, and achievement) among students receiving relaxation training and compared these students with a control group who received no relaxation training.

The general objective of the study was to compare behavioral characteristics such as absenteeism, tardiness, discipline, self-concept, and achievement in rural boys and girls in a school setting with relaxation training with boys and girls without training.

Four specific hypotheses operationalized the objective. They were:

1. Rural students in the seventh grade who receive relaxation training will tend to be absent from school less frequently and be tardy less frequently than similar students without such training.

The dependent variables, absenteeism and tardiness, were operationalized as the number of days each student was absent or late, respectively, during the 29 weeks of the study.

2. Rural students in the seventh grade who receive relaxation training will tend to demonstrate fewer problem behaviors than similar students without such training.

Two methods operationalized the dependent variable, problem behavior. First, researchers collected the number of times each student in the study was referred to the office for discipline. The second operationalization of problem behavior was the total score on the *Walker Problem Behavior Identification Checklist* (WPBIC; Walker, 1976).

3. Rural students in the seventh grade who receive relaxation training will tend to demonstrate greater self-concept than similar students without such training.

The dependent variable, self-concept, was operationalized as T scores on the seven scales of the *Self Observation Scales* (SOS; Katzenmeyer and Stenner, 1974) measuring self-acceptance, self-security, social confidence, self-assertion, peer affiliation, teacher affiliation, and school affiliation.

4. Rural students in the seventh grade who receive relaxation training will tend to demonstrate higher school achievement than similar students without such training.

The dependent variable, achievement, was operationalzied as the standard scale scores on the *Comprehensive Tests of Basic Skills* (CTBS), Form U, Level H (CTB–McGraw-Hill, 1981) for the total test, and the reading, language, and math subtests.

PROCEDURES

The Sample

The population was rural seventh grade students in 10 middle schools in a four county area (Bamberg, Calhoun, Lexington, and Orangeburg) in the midlands of South Carolina. The socioeconomic levels of the parents ranged from low to middle class.

The sample consisted of 532 students (260 girls and 272 boys) of which 273 were Black and 259 White. The researcher selected students by sampling two intact classes of seventh graders from each school prior to the beginning of school. The principals arranged the two classes within each school to have similar class schedules. At the time of selection, after schedules were constructed but prior to the opening of school, the researcher combined the classes and formed two new classes randomly from the combination. Class sizes depended upon the original two classes and ranged from 20 to 35 students.

By random selection, one of the two classes was the experimental, or treatment group; the other was the untreated control group. No students or teachers were aware of the pairing of classes but the information was known to the principal and the counselor in the school. The researcher randomly assigned teachers to the two groups. The experimental group knew only that they would participate in a stress management program as part of the regular curriculum.

The sampling plan achieved a large sample, blind to the existence and purpose of the study, assigned to directly comparable pairs of classes.

Design

The study employed a split-plot factorial design in which the plots were schools. Differences among the schools on any dependent variable were of no interest in testing the hypotheses which focused only on differences between the experimental and control groups and interactions between treatment and school.

The researcher formed two groups, one experimental and one control, in nine schools and four groups, two experimental and two control, in one school. Since the research design included two groups in each school formed randomly out of the same convenience sample, they were comparable prior to the study. The differences observed at the end of the study are attributed to the experimental intervention or contamination from a confounding variable. The researcher used every reasonable measure available to minimize confounding effects by: (1) requiring the schools to agree to the randomization process; (2) requiring the participants to be blind to the study; (3) collecting data on the dependent variables from the office so participants were unaware of the outcome variables; and (4) monitoring the experimental classrooms by direct observation.

Parents of students in the experimental group signed consent forms prior to the study for their children to participate in the stress management program. Also, prior to the testing phase in the spring, parents of students in both the experimental and control groups signed consent forms allowing researchers to collect test data.

Relaxation Training

Curriculum

The curriculum for the relaxation training period, a period which was early morning

homeroom or group guidance for children other than the experimental group, was a fused stress management program. The fused approach used several techniques designed to elicit the relaxation response at will and adjusted the techniques to the needs of middle school children. The program required a daily fifteen-minute period to teach and practice the technique with the students. Since students were already familiar with electronic media, it was reasonable to teach the techniques using tape recordings. Virtually all the exercises involved keeping the eyes closed throughout the practicums.

The techniques modified for preadolescents included progressive relaxation, breathing, autogenics, quieting reflex, and imagery. Progressive relaxation, a technique perfected by Edmond Jacobson (1974), emphasizes muscle tension in the various sets of muscles in the body. Deep, slow breathing, a technique incorporated with other relaxation approaches, is an important part of Yoga and other Oriental systems of relaxation (Ramacharaka, 1905; Spreads, 1978). Autogenics is a unique technique because the mind is encouraged to control the physical body using self-messages. Although autogenics began with research in Berlin in the 19th century, Wolfgang Luthe (1969) popularized the technique in North America. More recently, Charles F. Stroebel (1982) developed a quick technique for stress management called the quieting reflex. Stroebel encourages the person to induce the opposite behavior from that accompanied by stress: (1) breathing deeply; (2) smiling; (3) giving positive self-messages; and (4) allowing the muscles to go limp. The last technique used was that of imagery, another technique dependent totally upon the mind. The origin of imagery is unknown, however good teachers have always used the approach. The emphasis on imagery in stress management is more recent. Several authorities (Lupin, 1977; Lowenstein and Lowenstein, 1983) used the technique successfully.

The audio-taped exercises used in the study tended to progress from the concrete to the abstract level, that is, from progressive relaxation (muscles) to imagery (thoughts). In addition to the ten exercises developed by the principal investigator according to the concrete-abstract progression, the curriculum used programs developed by Charlesworth (1981), Holland (1980), and Lupin (1977). Teachers of the experimental groups received an instructor's manual developed by the principal investigator (Matthews, 1982a) which outlined the exercises to use daily for the first semester. A supplement, supplied the second semester, outlined the exercises for the final phase of the treatment. The exercises with dates appear in Appendix A of the report.

In addition to the audio-taped exercises, two biofeedback instruments, the GSR^2 (galvanic skin resistance monitor) and the Bio-Temp Band (wrist temperature indicator), were part of the relaxation training. (Thought Technology of Montreal, Canada distributes the GSR^2, and Bio-Temp Products in Indianapolis, Indiana distributes the Bio-Temp Band.)

The galvanic skin resistance monitor, used only once every two weeks, gave a measure of the moisture on the hands. Skin provides an excellent measure of relaxation or tension since skin resistance increases with calmness and relaxation and decreases with tension. The monitor gave a low sound for the direction of relaxation and a high, shrill sound for the direction of tenseness. Although the biofeedback device was used only once every two weeks with the experimental group, children learned new awareness of the internal state of the mind and body by the method.

The wrist temperature indicator, with a temperature range from 72°F (22.2°C) to 100°F (37.8°C) gave a feedback measure daily. The band, worn like a wristwatch, utilized liquid crystal technology, extremely sensitive to temperature. The experimental group recorded their wrist temperature before and after the audio-taped exercise.

The relaxation training consisted of the fused program of relaxation exercises and biofeedback. The measures of wrist temperature gave the researcher a criterion of relaxation for all the children each day.

Teacher Training

The teachers of the experimental children received training in the relaxation procedure in a three-day workshop in August before the treatment began in September. The research staff explained the instructor's manual and engaged the teachers in the relaxation exercises. In addition to the relaxation exercises, teachers became aware of their internal functioning by using the EEG and digital skin temperature monitors. Although the curriculum design required only that the teachers follow the directions in the manual, the research staff believed teachers would better administer the treatment if they understood the theory. Therefore, the teachers received background information about stress. The workshop emphasized the importance of following directions in the instructor's manual. The study required that every child in the 10 schools in the treatment group participate in the ***same*** relaxation exercise on the ***same*** day.

A second training session further instructed experimental teachers and principals. The purpose of the training session held in March was planning for testing. Since all content teachers of the children, both experimental and control, received the ***Walker Problem Behavior Identification Checklist***, the experimental teachers and the principals received information concerning the completion of the instrument. After the training session, the principals informed the control and other content teachers about the checklist. Since the school coordinator administered the *Self Observation Scales* and collected the attendance and tardiness data, it was important that scheduling for these activities be completed at the session also.

The school coordinator provided another form of teacher training. As an ancillary procedure, the school coordinator visited the experimental teachers once every two weeks throughout the study and helped instructors with problems. On the same visit, the school coordinator conducted the relaxation exercise for the day and supplied the biofeedback instrument, the galvanic skin response monitor, to assist the children in eliciting the relaxation response at will.

In summary, teacher training consisted of organized sessions and informal individualized assistance. The research staff monitored the instruction in relaxation training in the schools frequently. The training of teachers was an essential aspect of the study.

Measures of Relaxation

Children recorded their wrist temperatures immediately before and after the relaxation exercises by using a wrist temperature indicator. Wrist temperature increases as individuals become more relaxed. Therefore, pre and postreadings of skin temperature provided a daily measure of the relaxation state and the cumulative averages over time determined the value of practice.

Ambient Stress. Ambient stress is the general stress level in a particular setting. School may be a stressful situation for some children, but some schools may be highly stressful, while others are extremely relaxed. Some stress is necessary, understimulation requiring increased stress and overstimulation requiring decreased stress to achieve the maximum degree of effective performance (Gmelch, 1977). Prereading (prior to the relaxation exercise) wrist temperatures provided a measure of ambient stress for each student. Averages across all the participating students in each school provided a measure of ambient stress in the schools.

Figure 1 depicts the means of the prereading wrist temperatures for each school. The number of observations in each case is the number of students in the class multiplied by the number of days of the study. The data are presented as part of Table 1 (with the exception that the first two classes given in the table were collapsed to one group in the graph since the two classes are in one school).

The means range from 83.89°F (28.83°C) to 90.36°F (32.42°C). The means, based on 1,400 to 3,600 cases each, are quite stable and indicate a reasonable measure of the stress level in each school. Obviously, schools are very different in how much stress they produce.

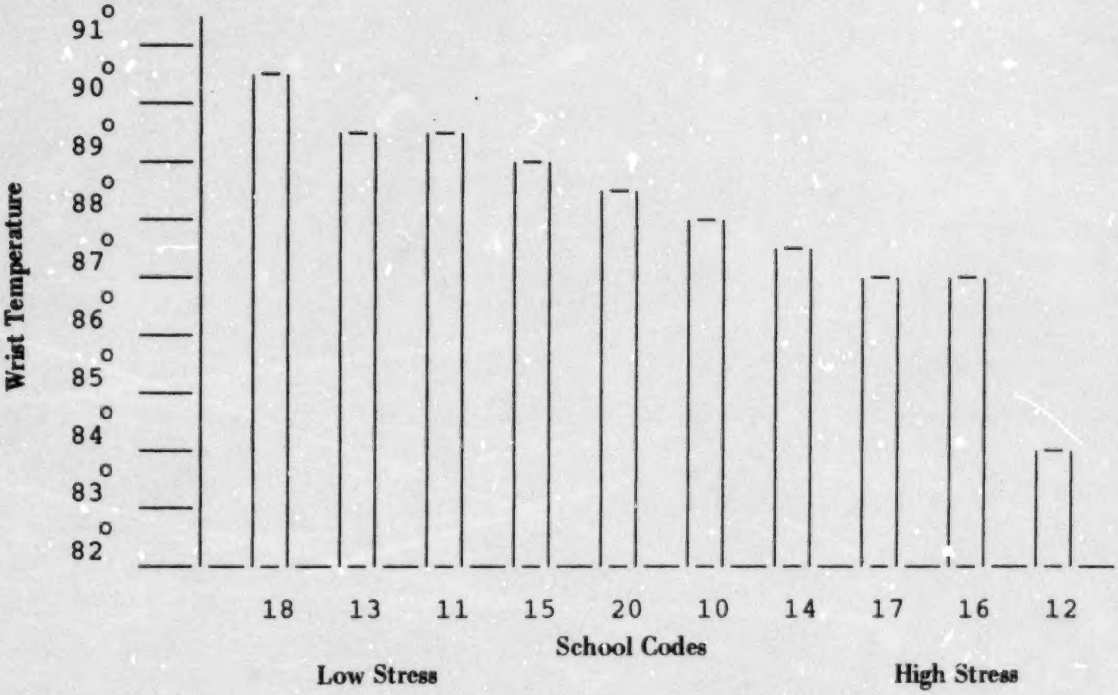

Fig. 1. Ambient Stress Levels

TABLE 1

WRIST TEMPERATURE MEANS

Class	N	Pre Mean	Post Mean	Mean Difference
1	1280	89.17	92.34	3.17
2	1557	86.71	89.73	3.02
3	2901	89.20	91.29	2.09
4	1409	83.89	86.30	2.44
5	2965	89.50	92.56	3.06
6	2556	87.75	89.59	1.84
7	1550	88.88	91.91	3.03
8	2482	86.74	88.84	2.12
9	2215	87.20	90.11	2.90
10	3674	90.36	92.66	2.31
11	2728	88.04	90.77	2.73

Note: All figures and tables reporting temperatures use degrees Fahrenheit.

It is still not known what level of stress is optimal, only that neither extremely low nor extremely high levels of stress are beneficial.

These initial (prereading) wrist temperatures are related to how much increase can be expected during the relaxation exercise. The correlation between prereading wrist temperatures and the increase in wrist temperatures from prereading to postreading is -.39. Logically, the more relaxed an individual is initially (high wrist temperature), the less change (increase) may be expected. Conversely, individuals who are tense can relax more (from low wrist temperatures to high).

Pre-Post Change in Wrist Temperatures. Differences were anticipated among the eleven classes in their ability to relax, and thus in their mean wrist temperature increases. There may be a variety of reasons for interclass differences, such as classroom environment, teacher enthusiasm, peer influence, and length of available time. Table 1 presents the mean prereading, postreading, and difference (post minus pre) wrist temperatures for each of the eleven classes. There are clear differences across class, with the mean increase ranging from 1.84°F (1.02°C) to 3.17°F (1.76°C).

With the classroom used as the unit of analysis (n = 11), the researcher conducted a dependent t test between the prereading and postreading to determine whether the increase in wrist temperatures was significant. The t value of 18.64 was significant at the pre-established .05 level of significance. Actually the exact probability of the t value is less than .0001. This finding indicates that the relaxation exercises were effective in raising wrist temperatures, the measure of relaxation response in the study.

The Effect of Practice on Changing Wrist Temperatures. By studying the changes in wrist temperatures as the study progressed, the researcher examined the effects of time and practice on relaxation skills. The wrist temperature readings were compiled by taking the mean across all the experimental students and across the five days of each week in the twenty-nine weeks of the study. Table 2 reports these means for the prereading, the postreading, and the difference (increase from the prereading to the postreading). The table shows an increase (positive difference) for each of the twenty-nine weeks from September 20 to April 29.

Figure 2 graphically displays the weekly mean wrist temperature differences as a time-series (solid line). If practice is an important factor in learning to relax, the change in wrist temperatures should increase over time. The Pearson product moment coefficient of correlation between the week and the mean increase in wrist temperatures was .76, which is significant at the .05 level. This shows that practice may be an important factor associated

TABLE 2

MEAN WRIST TEMPERATURES BY WEEKS

Week	Prereading	Postreading	Difference	Ambient Temperature	Corrected Temperature
1	89.36	91.18	1.82	55.6	1.98
2	88.56	90.81	2.27	53.0	2.38
3	89.88	91.96	2.07	56.6	2.25
4	89.23	91.56	2.33	55.8	2.49
5	88.69	91.16	2.48	48.4	2.55
6	87.93	90.54	2.62	36.2	2.56
7	89.44	91.81	2.37	50.2	2.47
8	88.09	90.53	2.44	36.6	2.40
9	87.59	90.28	2.69	37.4	2.65
10	89.08	91.87	2.79	43.2	2.83
11	89.77	92.24	2.47	50.8	2.58
12	88.09	90.52	2.45	43.8	2.46
13	87.81	90.17	2.38	30.6	2.25
14	87.45	89.93	2.47	29.6	2.36
15	86.19	88.78	2.59	20.4	2.37
16	87.76	90.51	2.75	29.8	2.63
17	88.21	90.93	2.72	36.6	2.69
18	87.44	90.13	2.69	27.0	2.54
19	87.69	90.47	2.78	29.6	2.66
20	88.08	90.83	2.75	40.2	2.74
21	88.04	90.75	2.71	37.6	2.68
22	88.48	91.32	2.84	47.8	2.60
23	88.17	90.75	2.58	44.2	2.61
24	87.44	90.17	2.74	36.4	2.68
25	86.99	89.74	2.74	39.8	2.74
26	90.05	93.01	2.96	51.4	3.08
27	87.82	90.54	2.72	49.2	2.81
28	87.22	89.92	2.70	33.2	2.61
29	87.61	90.38	2.77	44.6	2.82

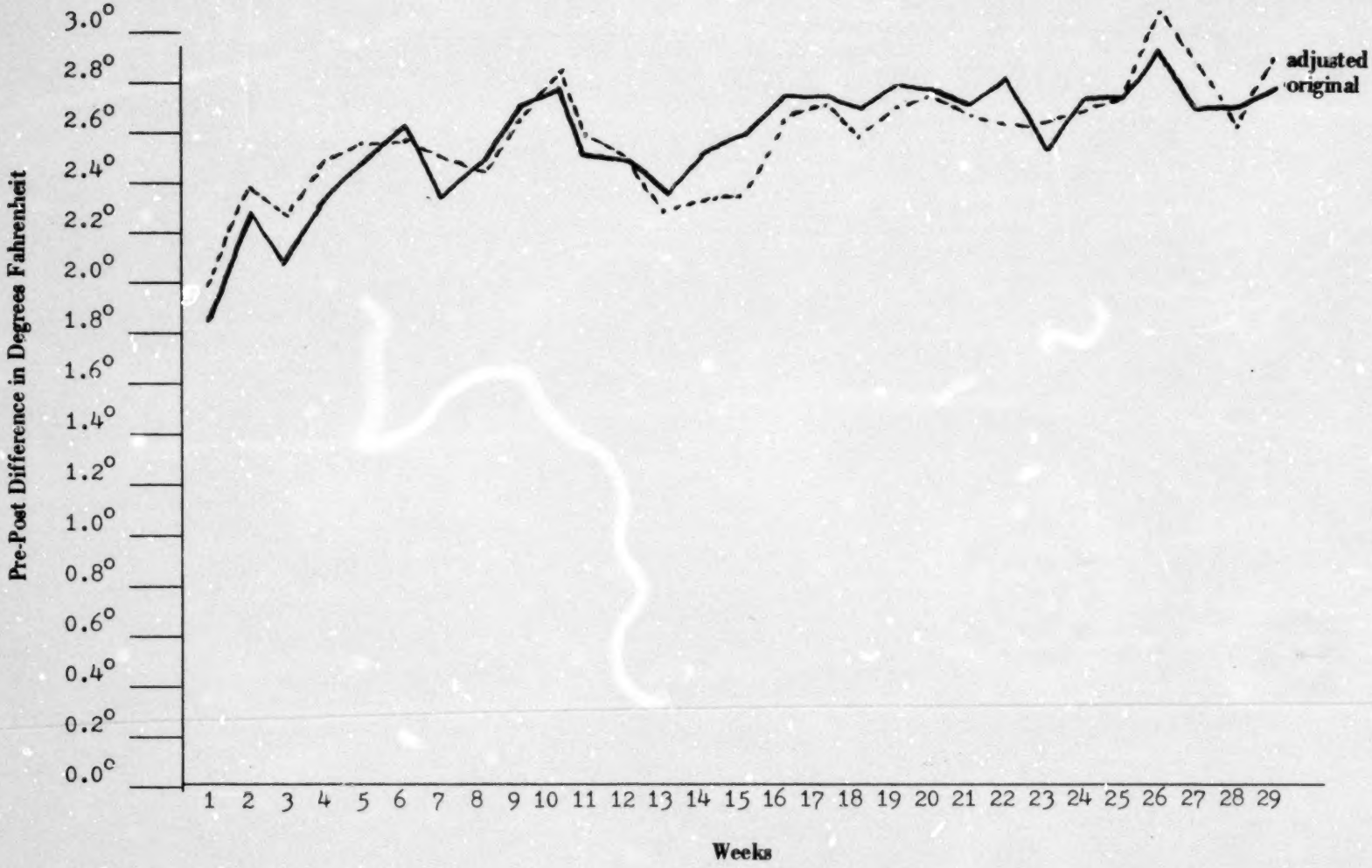

Fig. 2. Time-series graph of weekly average increase in wrist temperature and corrected average increase in wrist temperature.

with learning relaxation skills. The decreases which are most apparent are at weeks 7 (Halloween), 13 (Christmas), and 23 (Spring Break) indicating the heightened tension which surrounds such holidays and perhaps the regression caused by having a break in the daily relaxation routine.

Ambient Temperature. The postreading temperature attained is largely a function of the prereading temperature. The correlation between the prereading and postreading wrist temperatures was a significant 0.96 (n = 29). With postreading temperatures so apparently dependent on prereading temperatures, it seemed more valuable to examine only the increase or difference scores (post minus pre). However, researchers must account for the wide variation in prereading temperatures. If the prereading temperatures indicated the degree of relaxation the student had upon entering, then this valuable information would be lost in the use of difference scores. If, on the other hand, prereading temperatures were merely a function of ambient temperature, then only the increase in temperature would provide useful data.

The researcher defined ambient temperature as the average low temperature over each five-day school week as measured by the South Carolina Central No. 2 (Orangeburg) Weather Station. Table 2 gives the mean ambient temperature for each of the twenty-nine weeks of the study along with the prereading, postreading, and difference wrist temperatures. The correlation between ambient temperature and prereading wrist temperature was .82. Thus, the outside temperature accounted for 67 percent of the variation in initial wrist temperatures ($r^2 = .67$) which in turn accounted for 93 percent of the variation in postreading wrist temperatures ($r^2 = .93$).

A Method for Adjusting Wrist Temperatures. Actual wrist temperatures clearly are largely a function of ambient temperature. The researcher adjusted wrist temperatures using a simple regression technique. The technique regressed prereading and postreading wrist temperatures on ambient temperatures individually and the residuals from the regression line became the new data points. To return the data to the original scale, the researcher added the residuals to the mean of the original data points. When this procedure was done with both prereading and postreading data, the difference between the new measures became the new adjusted wrist temperature increases.

Table 2 presents the adjusted mean temperature increases for each of the twenty-nine weeks of the study. Figure 2 presents the data graphically (dotted line) where it may be directly compared with the increases prior to the adjustment. The adjusted increases correlate with the week at .68 (n = 29) just slightly lower than the correlation with the original differences.

Adjusting temperatures for ambient temperature appears to change the pre-post increase only slightly (the correlation between the increase and the adjusted increase is .89). The adjustments to the actual prereadings and postreadings are much more dramatic due to their higher correlations with ambient temperature. As a result of this part of the study, the author has three suggestions concerning ambient temperature. (1) If one measures pre-post difference in a setting where ambient temperature does not change, adjusting wrist temperature is probably unnecessary. (2) If the ambient temperature changes between the prereading and the postreading, the wrist temperatures should be adjusted. (3) If one examines single temperature measures (rather than pre-post) in a longitudinal study of general stress level, the temperatures should be adjusted for ambient temperature.

Effectiveness of Curriculum

Audio tapes. Table 3 presents the mean wrist temperature increase from daily prereading to postreading (in degrees Fahrenheit) for each of the relaxation exercises over the duration of the study. The five exercises with the lowest means (QR reinforcement, Matthews 1, Matthews 2, Holland A, and Holland B) were introductory exercises with declining effectiveness over time and were discontinued midway through the study following preliminary results. The remaining twenty-three audio-taped exercises resulted in average wrist temperature increases ranging from 2.24°F (1.24°C) to 2.82°F (1.57°C). All of the exercises appear effective in eliciting the relaxation response. Figure 3 graphically presents the data on the remaining twenty-three exercises ordered according to their effectiveness.

Teacher and Student Evaluations. The research staff constructed a Teacher Questionnaire (Appendix B) to obtain feedback from the eleven teachers. The staff carefully screened the twenty-two questions for wording and syntax and designed them to cover the major aspects of the study. The instrument was presumed to have content validity. The questionnaire covered three main areas: (1) reactions of students; (2) relaxation training; and (3) the research staff. The questionnaire stated one-third of the questions negatively, that is, a negative response indicated a positive opinion.

All eleven teachers completed the *Teacher Questionnaire* at the testing workshop in March, 1983. The researcher compiled the results by taking percentages responding to each category for each item, the average response to each item, and the average response to items for each total subscale. The questionnaire was a Likert scale where "1" indicated Strongly Agree, "2" indicated Agree, "3" indicated Undecided, "4" indicated Disagree, and "5" indicated Strongly Disagree. The researcher reversed the scoring for the negative items prior to compiling the results.

TABLE 3

MEAN CHANGE IN WRIST TEMPERATURES FOR EACH TAPED EXERCISE

Tape Number*	Tape Name	Mean	St. Dev.
1	Charlesworth	2.62	1.72
2	Holland B	1.70	2.04
3	Holland C	2.24	1.83
4	Holland D	2.52	1.76
5	Holland E	2.57	1.66
6	Matthews 1	1.87	1.91
7	Lupin I-3	2.52	1.67
8	Holland A	1.75	1.98
9	GSR	2.53	1.75
10	Matthews 3	2.63	1.65
11	Matthews 4	2.63	1.68
12	Matthews 5	2.38	1.68
13	Matthews 2	1.69	1.84
14	Matthews 6	2.44	1.64
15	Matthews 7	2.56	1.67
16	Lupin I-4	2.75	1.60
17	Q R Reinforcement	2.17	1.96
18	Matthews 8	2.63	1.64
19	Matthews 9	2.52	1.76
20	Matthews 10	2.57	1.70
21	Lupin I-5	2.69	1.72
22	Lupin I-6	2.77	1.66
23	Lupin II-1	2.70	1.69
24	Lupin II-2	2.73	1.70
25	Lupin II-3	2.66	1.70
26	Lupin II-4	2.82	1.78
27	Lupin II-5	2.74	1.72
28	Lupin II-6	2.75	1.70

*Note: Tape numbers were assigned chronologically as tapes were introduced into the program and data were collected.

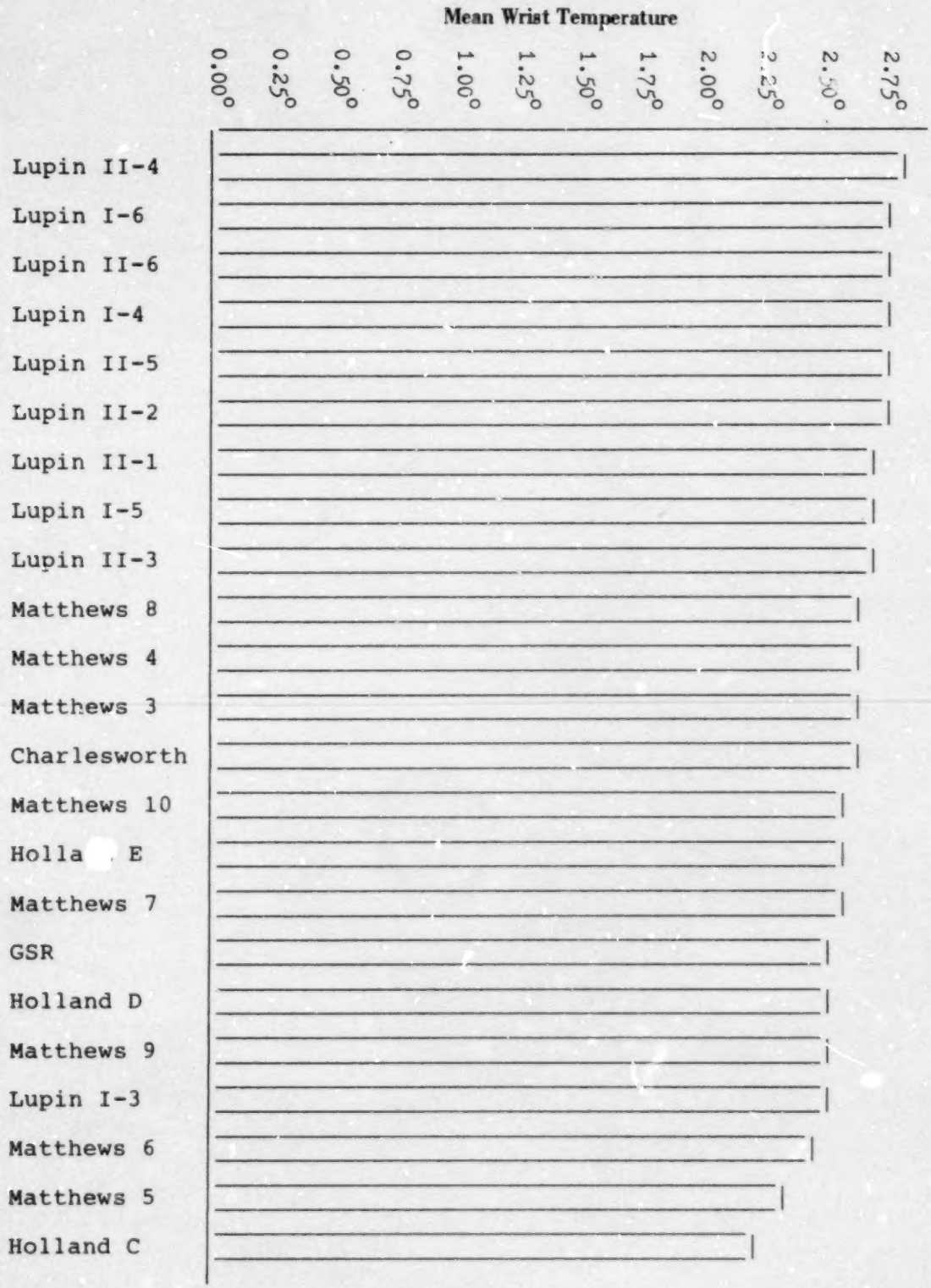

Fig. 3. Graph of the Relative Effectiveness of the Relaxation Exercises

Table 4 presents the percentage of teachers responding to each category for each item. All teachers responded to all the questions, so the table includes no additional category for "No Response." Overall, there appeared to be a positive response with most answers in the categories (1) Strongly Agree and (2) Agree and few (4) Disagree or (5) Strongly Disagree.

Table 5 presents the average response to each item and an average for each of the three subscales. An average response greater than 3.5 indicates an undecided or negative opinion. Only item 2 with an average of 3.64 was negative. The wording of this item was the major problem as determined from the comments of the teachers. The item read "The students lose interest in relaxation training over time," a negative item with reversed responses. The comments from the teachers indicated that students kept interest in relaxation training but lost interest in some of the relaxation exercises which repeated a number of times during the study. A flexible and non-repetitive program would seem desirable to retain a high level of interest.

Ten of the eleven teachers made additional comments at the end of the questionnaire. There were six basic comments which are given in Table 6 along with the frequency (or number of teachers who made a similar comment). The most frequent comment was that one or more individual students altered dramatically as a result of the relaxation training.

Among the comments there were four suggestions for improving the program. They were:

1. "It would be helpful to have more time . . . . Maybe scheduling two short periods each day . . . ."

2. "There should be more options as to whether a tape should be played on certain days."

3. "The time slot is very short . . . and limits the procedure."

4. ". . . more practical application situations."

The research staff also constructed a *Student Questionnaire* (Appendix C) to obtain affective feedback from the students involved in the relaxation training (the experimental group). The instrument consisted of twenty-two items covering most aspects of the research. The items were in two major categories: (1) the relaxation training; and (2) the staff. These two areas constitute two subscales of the questionnaire. Staff members carefully reviewed

TABLE 4

PERCENTAGE OF TEACHERS RESPONDING TO A LIKERT SCALE FOR EACH QUESTIONNAIRE ITEM

Item	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	27	73	0	0	0
2	0	18	0	82	0
3	27	55	18	0	0
4	36	28	9	18	9
5	0	64	27	9	0
6	9	64	27	0	0
7	36	55	0	9	0
8	100	0	0	0	0
9	100	0	0	0	0
10	46	36	0	0	18
11	82	18	0	0	0
12	55	45	0	0	0
13	73	27	0	0	0
14	64	27	9	0	0
15	36	64	0	0	0
16	64	36	0	0	0
17	18	55	9	18	0
18	27	73	0	0	0
19	73	27	0	0	0
20	73	27	0	0	0
21	55	45	0	0	0
22	36	36	28	0	0

TABLE 5

MEAN RESPONSES FOR EACH ITEM AND MEAN RESPONSES FOR EACH SUBTEST ON THE TEACHER QUESTIONNAIRE

Item	Mean	Item	Mean	Item	Mean
1	1.73	8	1.00	15	1.64
2	3.64*	9	1.00	16	1.36
3	2.00	10	2.09*	17	2.27*
4	2.36*	11	1.18	18	1.73*
5	2.43	12	1.45*	19	1.27
6	2.18	13	1.27	20	1.36
7	1.82	14	1.45	21	1.45*
				22	1.91
Student scale	2.03	Relaxation scale	1.21	Staff scale	1.62

*Responses were reversed for negatively stated items prior to computing averages.

TABLE 6

SUMMARY OF TEACHERS' COMMENTS

Frequency	Comment
2	Impact on the teacher's relaxation state or attitude
3	General behavior improvement
3	Effect on a hyperactive student
4	Worthwhile and rewarding experience
4	Suggestion for program improvement
5	Specific impact on an individual's behavior

each item to insure content validity and face validity. There were seven of the twenty-two items (approximately one-third) stated negatively.

Two hundred sixty-one students in the experimental group were present on the day of testing and completed all of the questionnaire. The researcher computed the percentage of students responding to each category for each item, the average (mean) response to each item, and the average for the subscales. The questionnaire was a five-point Likert scale similar to the *Teacher Questionnaire*. The researcher reversed the scoring for the negatively stated items prior to compiling the results.

Table 7 presents the percentage of students responding to each category for each item. The majority of responses appear to be in the categories (1) Strongly Agree and (2) Agree indicating a generally favorable impression of the overall project.

Table 8 presents the average response to each item and the average for each subscale. An average response greater than 3.5 indicates a generally negative attitude. Students viewed only item 16 negatively with an average of 3.72. The item stated "Most of the students in my class hate doing the morning exercises." The negative response to this item is inconsistent with the other items and may have been due to the volatile word "hate." It seemed likely that the students found this item amusing (especially since the questionnaire was read aloud), and, in fact, this is what some teachers reported. Their reponses may be a reaction to the wording of the item.

An average response between 2.5 and 3.5 indicates an undecided attitude. Four items fell in this group (items 6, 10, 12, and 14). The remainder of the items were positive.

In general, the students saw the relationship between relaxation training and stress management skills as they apply to life. Apparently, there was an understanding that relaxation techniques require no special equipment and can be used outside the classroom; however, actually transferring these skills and using them at home is problematic. Students saw the general value of relaxation training for improving self-concept, behavior, school work, and imagination.

One problem in the study was the need to repeat tapes occasionally, causing the students to lose interest to some degree. This is reflected in the failure of the students to realize the need for practice in relaxation. However, the interest of the students was higher when biofeedback instruments such as the GSR[2] were used in class.

Students saw both subscales, on the training and the staff, positively. Students rated the staff slightly higher than the relaxation training as a whole, with positive statements for both the teachers and the school coordinator.

TABLE 7

PERCENTAGE OF STUDENTS RESPONDING TO A LIKERT SCALE FOR EACH QUESTIONNAIRE ITEM

Item	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	24	48	15	8	5
2	35	50	7	5	3
3	33	43	13	7	4
4	23	42	11	13	11
5	18	46	12	17	7
6	17	30	26	16	11
7	38	43	7	8	4
8	20	46	17	11	7
9	23	51	15	5	6
10	18	38	18	17	9
11	39	49	4	5	3
12	19	34	17	18	11
13	34	48	6	8	4
14	20	40	14	15	11
15	28	48	9	9	6
16	6	14	19	25	36
17	20	44	13	15	8
18	22	44	14	13	7
19	30	40	10	9	11
20	37	42	6	6	9
21	34	30	20	9	7
22	28	34	13	14	11

TABLE 8

MEAN RESPONSES FOR EACH ITEM AND MEAN RESPONSES FOR EACH SUBTEST ON THE STUDENT QUESTIONNAIRE

(N = 261)

Item	Mean	Item	Mean
1	2.21	13	2.00
2	1.92	14	2.58*
3	2.05*	15	2.18
4	2.46	16	3.72*
5	2.50	17	2.47*
6	2.73	18	2.40
7	1.97*	relaxation training subscale	2.38
8	2.41	19	2.30*
9	2.19	20	2.08
10	2.62	21	2.25
11	1.82	22	2.46
12	2.69*	staff subscale	2.27

*Indicates a negatively stated item with scoring reversed

RESULTS

Results of the Study of Absenteeism and Tardiness

The researcher collected the number of absences and tardies for each student in both the experimental and control groups. Tables 9 and 10 show absenteeism and tardiness means, respectively. The tables show the means for the experimental and control groups separately within each of the eleven pairs of classes. The means indicate the average number of absences or tardies per student over the entire school year. Evident in the data, but not of major concern, are the differences among the schools. The highest absentee rate is 8.38 average absences per student, while the lowest is 1.69. Both of these classes were in the experimental group. Obviously, there are large school differences in absenteeism due to a variety of outside and school-related influences. The same is true of tardiness which ranges from 0.25 average tardies per student to 8.88. Besides other influences, tardies may depend upon the reporting system employed within each school.

Figures 4 and 5, respectively, present the absentee and tardy data graphically. The figures show each school with the experimental group on the left and the control group on the right. A dotted line divides each figure. Schools to the left of this line had higher absentee or tardy rates in the experimental group than in the control group. Schools to the right of the dotted line had higher absentee or tardy rates in the control group than in the experimental group. The schools split approximately evenly. Thus, while individual schools may show differences favoring either the experimental or control group, these differences average out when all the classes are included.

With the class as the unit of analysis, the researcher computed the total absentee and tardy rates for the experimental and control groups. Tables 11 and 12 present the means and standard deviations for absenteeism and tardiness, respectively. The experimental group has a slightly higher absentee rate than the control group. This difference is not significant, however, as indicated by the very low t value. In tardiness, the control group average a slightly higher rate; however, this difference also proved non-significant.

There apparently are no differences between the experimental and control groups in either absences or tardies. Perhaps more time would be required to affect such an overt behavioral measure. More likely, absenteeism and tardiness are variables controlled to a large extent by forces outside the influence of the student. Parental attitude and family obligations including family illness and death or family vacations create situations beyond the control of the student. Also, the differences between excused and unexcused absences were not taken into account, so such problems as late school buses were taken as tardies although students were not responsible. Illness, the method each school uses to report the tardies and absences, and other extraneous variables may affect the results.

TABLE 9

AVERAGE NUMBER OF ABSENCES PER STUDENT IN EACH SCHOOL

School	Experimental		Control	
	Mean	St. Dev.	Mean	St. Dev.
10	8.38	9.77	5.09	4.42
11	4.86	4.48	8.38	5.87
12	2.24	1.90	2.88	3.25
13	8.11	10.80	4.16	5.08
14	7.59	7.47	3.93	3.52
15	4.88	3.91	5.52	4.19
16	1.69	2.70	2.72	3.14
17	7.43	8.17	4.04	4.13
18	5.15	5.36	4.92	5.14
19	5.70	7.06	5.53	6.60
20	3.43	2.62	4.04	2.96

TABLE 10

AVERAGE NUMBER OF TARDIES PER STUDENT IN EACH SCHOOL

School	Experimental		Control	
	Mean	St. Dev.	Mean	St. Dev.
10	2.96	3.33	2.27	2.80
11	5.18	5.54	0.76	0.77
12	1.08	1.32	0.75	0.85
13	4.94	5.07	3.50	5.64
14	6.67	8.97	8.88	11.34
15	0.52	0.96	1.56	2.10
16	0.25	0.58	5.56	13.13
17	1.30	1.99	2.21	3.27
18	6.64	8.61	6.04	6.63
19	0.64	1.67	1.17	1.66
20	0.61	1.40	0.54	1.40

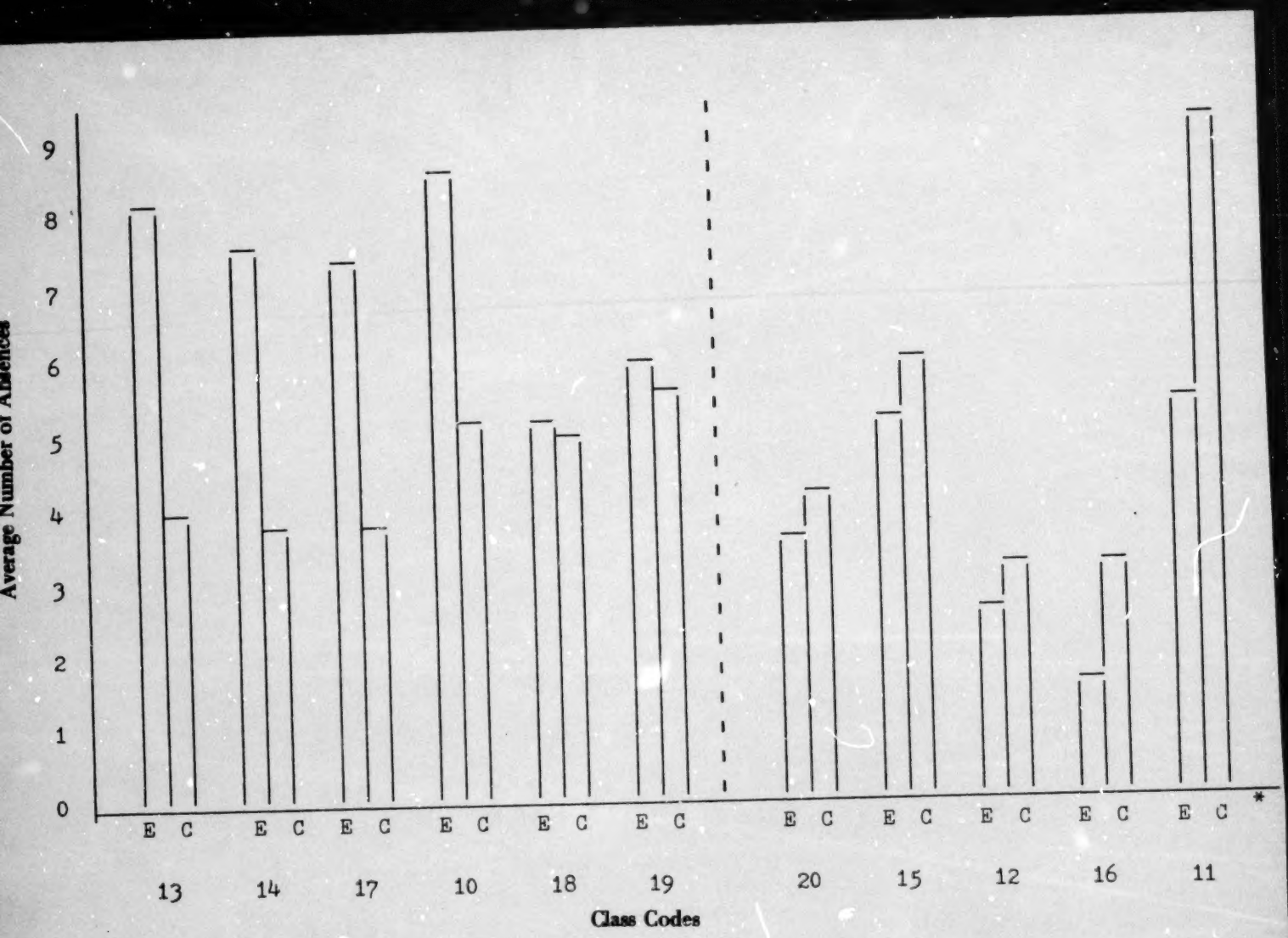

Fig. 4. Graph comparing average number of absences between experimental and control groups in each class.

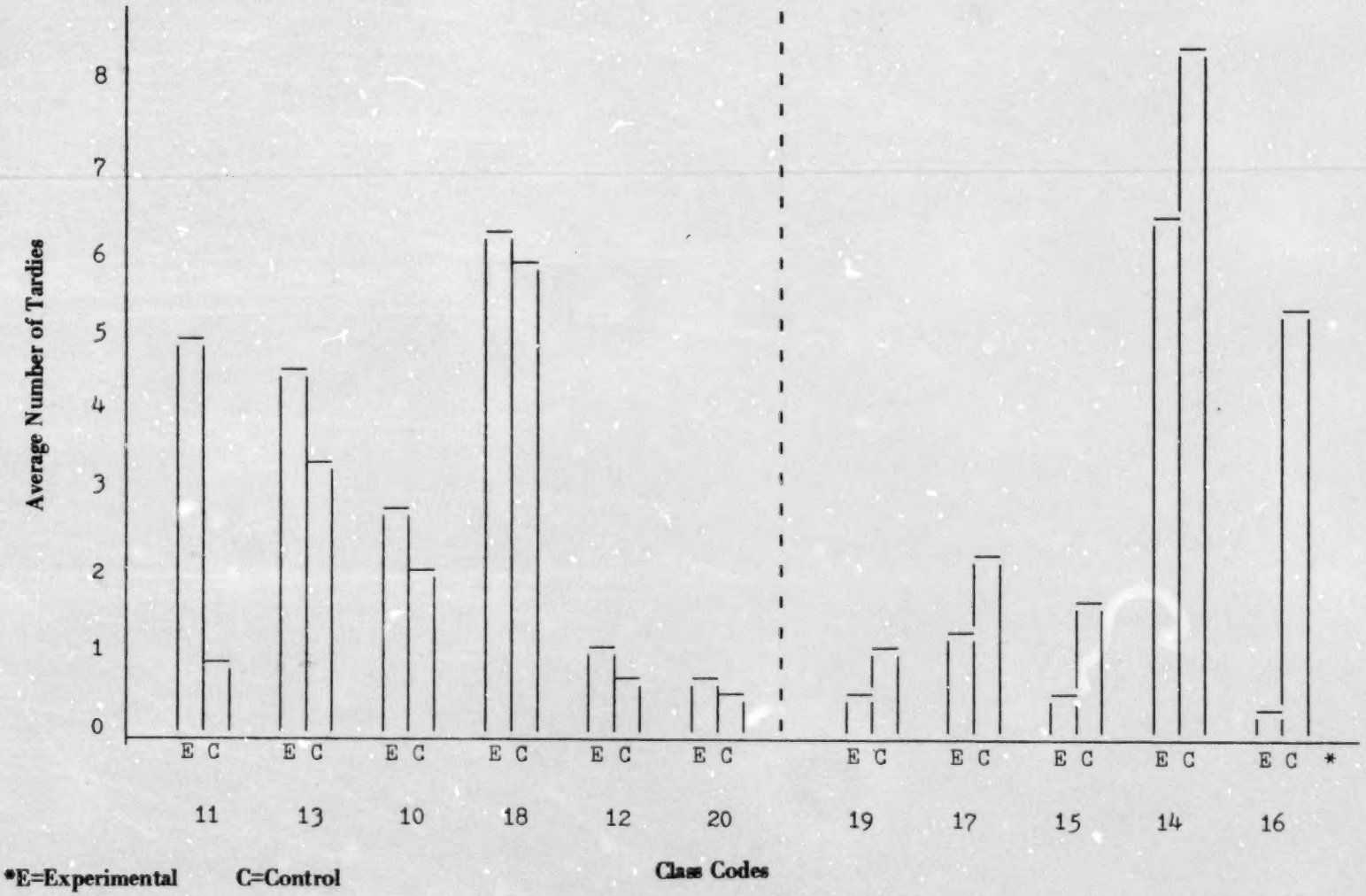

Fig. 5. Graph comparing average number of tardies between experiemental and control groups in each class.

TABLE 11

MEANS AND T TEST OF ABSENTEEISM

(N = 11)

Group	Mean	St. Dev.	t value
Experimental	5.41	2.31	0.89
Control	4.65	1.55	

TABLE 12

MEANS AND T TEST OF TARDINESS

(N = 11)

Group	Mean	St. Dev.	t value
Experimental	2.80	2.58	- 0.20
Control	3.02	2.71	

Results of the Study of Problem Behavior

Discipline Infractions

Table 13 reports the frequencies of discipline infractions for the control and experimental groups and the results of a chi square test of significance between the two proportions. The chi square value of 12.78 is significant at the .05 level of significance, indicating that the number of discipline problems differ between the control group and the experimental group. The researcher further separated the data into seventeen specific discipline violations in order to determine exactly which types of unacceptable behavior were affected by the relaxation training. Three of these infractions had no incidents in either the experimental or control groups. Table 14 reports the data for the remaining fourteen violations. The researcher conducted chi square tests for nine of these fourteen areas and reported the results in Table 14. Of the nine behavior types tested, only the discipline problems of "fighting" and "cutting class" have significant chi square values at the 0.006 level of significance. The researcher used an alpha level of .006 in this case to produce an approximate family-wise error rate of .05 for the nine tests. The control group had a higher number of instances of fighting than did the experimental group. This result supports the hypothesis that students with relaxation training will exhibit fewer instances of explosive types of behavior compared to students without training, since the "fighting" category is the most explosive of the discipline categories.

The results of the chi square tests support the hypothesis that there are significantly fewer discipline problems among students who receive the relaxation training than among those who do not receive the training. Apparently, the relaxation program decreases the number of incidents of disruptive behavior, particularly cutting class and such explosive behavior as fighting. This finding indicates that students receiving relaxation training are less likely to exhibit types of behavior which are considered unacceptable. One possible explanation of this finding is that students receiving relaxation training remain relatively calm throughout the day.

Perceived Problem Behavior

Teachers completed the *Walker Problem Behavior Identification Checklist* (WPBIC) for each student in the experimental and control groups. Language Arts, Math, Social Studies, and Science teachers completed a checklist for the students in their respective classes. Thus, the researcher averaged across four raters in determining a score for each student, a method which improves the reliability of the results.

TABLE 13

FREQUENCY TABLE AND CHI SQUARE TEST OF DISCIPLINE INFRACTIONS BETWEEN THE CONTROL AND EXPERIMENTAL GROUPS

Infraction	Control *(N=265)*	Experimental *(N=266)*	Chi Square Value
Total of discipline infractions reported to school office	264	188	12.78*

*Indicates a significant chi square value at the .05 level of significance

TABLE 14

FREQUENCY TABLE AND CHI SQUARE TESTS OF DISCIPLINE INFRACTIONS BY CATEGORY BETWEEN THE CONTROL AND EXPERIMENTAL GROUPS

Infraction	Control *(N=265*	Experimental *(N=266)*	Chi Square Value
Cutting class	14	3	7.12**
Leaving campus without permission	1	2	*
Loitering in unauthorized areas	3	5	*
Persistent disobedience	66	56	.82
Excessive noise/attention getting	35	31	.24
Persistently disturbing others	26	19	1.09
Disrespect/insubordination	43	32	1.61
Threatening/intimidating staff	6	3	*
Theft/cheating/gambling	0	1	*
Fighting	30	10	10.00**
Vandalism	1	0	*
Physical abuse of students/staff	20	17	.24
Habitually failing to do homework	9	3	3.00
Habitually failing to do classwork	10	6	1.00

*Chi square values were not computed where combined cell sizes were less than 10.

**Indicates a significant chi square value at the total family-wise error rate of .05.

***Note: All observations reported reflect actual frequencies of reported discipline incidents.

The WPBIC has five scales: acting-out; withdrawal; distractibility; disturbed peer relations; and immaturity. Higher scores on each subscale (and the total) indicate a greater degree of problem behavior. "If a male pupil receives a Total Score of 22 (T score of 60) or higher, he is classified as disturbed. If a female pupil receives a Total Score of 12 (T score of 50) or higher, she is classified as disturbed." (Walker, 1976).

Table 15 reports the means and standard deviations of total scores for the experimental and control groups in each school. As anticipated, there are large differences among schools; but apparently there are no differences between the experimental and control groups. Table 16 reports the results of six two-way analyses of variance (one for each subscale and the total score). The overall F tests were all significant because the main effect of class differences was always significant. However, the experimental/control main effect was not significant in any of the six tests, nor were there any significant interactions. Table 16 reports only the F values associated with the experimental/control main effect.

Apparently, the relaxation training had no effect on problem behavior as perceived by teachers completing a checklist. This finding is at odds, however, with the results of the study of discipline infractions. The actual count of discipline infractions indicated a significantly reduced number of incidents of problem behavior in the experimental group. As a more direct measure than teacher ratings, discipline infractions may be the best indicator. The lack of significant results on the WPBIC may be due to the indirect nature of the instrument. However, more likely, relaxation training only affects overt behaviors which tend to result in discipline referrals while the more varied and subtle forms of problem behavior go relatively unchecked.

Results of the Study of Self-Concept

Testing, including the administration of the *Self Observation Scales* (SOS) to measure self-concept, occurred at the end of the relaxation training program. The school coordinator administered the SOS to the students, reading each statement aloud. The SOS is a nationally-normed, multidimensional instrument for measuring the way students perceive themselves (self-concept). The junior high level of the SOS measures seven dimensions of self-concept. High scores on each scale are most characteristic of the scale name. The scales are self-acceptance, self-security, social confidence, self-assertion, peer affiliation, teacher affiliation, and school affiliation.

Table 17 reports the means and standard deviations of the experimental and control groups on each of the seven subscales. The experimental group had a higher mean on all

TABLE 15

MEANS AND STANDARD DEVIATIONS OF WALKER PROBLEM BEHAVIOR IDENTIFICATION CHECKLIST TOTALS

School Codes	Experimental		Control	
	Mean	St. Dev.	Mean	St. Dev.
10	5.77	3.29	8.43	6.80
11	8.03	4.64	8.31	7.88
12	7.52	9.89	6.20	6.06
13	6.26	5.32	5.92	6.41
14	2.06	2.35	1.47	2.56
15	2.89	3.37	2.15	2.38
16	2.82	3.02	1.74	1.80
17	4.43	4.60	5.77	3.91
18	6.81	4.83	7.45	6.59
19	3.02	3.11	3.39	5.09
20	3.95	2.47	4.65	3.56

TABLE 16

F TESTS ON WALKER PROBLEM BEHAVIOR IDENTIFICATION CHECKLIST SUBSCALES

Subscale	F Value	Probability
Acting-Out	0.37	0.543
Withdrawal	0.05	0.826
Distractibility	0.01	0.912
Disturbed Peer Relations	1.50	0.221
Immaturity	0.04	0.847
Total	0.19	0.660

TABLE 17

MEAN SCORES ON THE SELF OBSERVATION SCALES

Subscale	Experimental		Control	
	Mean	St. Dev.	Mean	St. Dev.
Self-Acceptance	54.20	5.86	52.96	6.98
Self-Security	49.41	8.65	48.63	8.76
Social Confidence	48.06	10.16	46.88	9.78
Self-Assertion	53.55	9.70	51.40	9.63
Peer Affiliation	51.96	8.00	50.52	8.55
Teacher Affiliation	51.03	9.77	51.45	9.33
School Affiliation	48.94	11.33	48.93	10.30

subscales except teacher affiliation.

The results of the self-concept (SOS) measures were in the expected direction, that is, the experimental group scored higher on all self-concept scales except affiliation with the teacher. The researcher used two-way multivariate analysis of variance (MANOVA), with schools as the random factor and experimental or control group as the fixed factor. As anticipated, the main effect associated with the schools was significant (F approximation = 4.90; prob > F = .0001); however, the experimental/control main effect was not significant (F approximation = 1.70; prob > F = .1055). The lack of a significant main effect indicates that while students in different schools differ in self-concept for a variety of reasons, the introduction of a relaxation training program had no overall effect.

The initial results of the study of self-concept failed to support the hypothesis that students receiving relaxation training would have significantly higher self-concept scores than comparable students receiving no training. The results are quite different, however, when race and sex are included in the model. The single experimental/control effect was observed for females regardless of race; there is no effect for males nor for either racial group. A two-way MANOVA (school by treatment) conducted only with females produces significant results for both main effects and the interaction. The results of the experimental/control main effect (F approximation - 2.93; prob > F = .0060) were examined in further detail in the individual F tests reported in Table 18. Using a family-wise error rate for the seven simultaneous tests, the subscales of Social Confidence, Self-Assertion, and Peer Affiliation have significant experimental/control effects. The means for the control group females on Social Confidence, Self-Assertion, and Peer Affiliation are 46.36, 50.89, and 49.93, respectively; the corresponding means for the experimental group females are 49.78, 54.33, and 54.01. With the two groups assumed to be initially equal due to randomization, relaxation training appears to improve self-concept among female students but not among male students. This hypothesis deserves direct examination in future research.

Results of the Study of Achievement Between the Experimental and Control Groups

The South Carolina Department of Education in April of each year administers the *Comprehensive Tests of Basic Skills* (CTBS) to 7th graders. Table 19 reports the results of the CTBS for the students in the study. The table shows the mean scale score for the experimental group on the total battery and on the three subtests: reading, language, and math. Also reported is the difference between the mean for the experimental group and the

TABLE 18

F VALUES ON SELF OBSERVATION SCALES FOR FEMALES IN EXPERIMENTAL AND CONTROL GROUP*

Scale	Model	Type	School	Type x School
Self-Acceptance	2.09 .005	6.48 .012	2.73 .004	1.02 .425
Self-Security	1.45 .095	3.73 .055	1.83 .057	0.85 .579
Social Confidence	5.74 .000	8.71 .004**	10.74 .000	0.45 .920
Self-Assertion	2.75 .000	9.12 .003**	3.98 .000	0.89 .542
Peer Affiliation	1.75 .025	18.57 .000**	1.38 .192	0.45 .921
Teacher Affiliation	2.49 .001	0.19 .661	2.65 .005	2.56 .006
School Affiliation	2.13 .004	3.36 .068	2.95 .002	1.17 .310

* F values and probabilities for the specific effects of the two-way analyses:
Model = overall test
Type = the experimental/control main effect
School = the school main effect
Type x School = the interaction between the two main effects.

** Significant at the .007 level of significance (approximately 0.05 error rate overall).

TABLE 19

RESULTS OF THE COMPREHENSIVE TESTS OF BASIC SKILLS*

School Codes	Reading Scale Score	Reading Difference	Language Scale Score	Language Difference
10	670	-10	662	5
11	692	11	680	20
12	711	- 9	686	-13
13	692	- 5	666	-10
14	776	11	744	8
15	688	- 3	674	- 6
16	722	5	704	12
17	707	- 5	688	- 1
18	716	33	686	18
19	758	- 2	734	- 6
20	752	- 16	728	- 15

School Codes	Math Scale Score	Math Difference	Total Scale Score	Total Difference
10	696	- 3	676	- 3
11	702	10	691	13
12	714	- 1	704	- 7
13	698	- 2	685	- 6
14	738	5	753	8
15	698	- 5	686	- 7
16	718	2	714	5
17	703	- 5	699	- 4
18	710	17	704	23
19	727	- 4	740	- 3
20	719	- 3	733	- 11

* "Scale Scores" represent the mean scale score for the experimental group. "Difference" is the number of scale score points difference between the group means (control mean substracted from the experimental mean).

mean for the control group. This difference represents actual scale score points where a positive number indicates a higher mean in the experimental group and a negative number indicates a higher mean in the control group.

The researcher conducted independent t tests between the experimental and control groups on each of the three CTBS subtests and the total battery. The research used classes as the unit of analysis (n = 11). Table 20 shows the results. None of the four t tests conducted were significant at the .05 level. The two groups do not differ on CTBS scores. Simply participating in the relaxation exercises does not influence cognitive processes.

The researcher then compared the CTBS scores to the wrist temperatures (relaxation indicators). Figure 6 plots the difference between prereading and postreading wrist temperatures against the difference between total CTBS scores for the experimental group and total CTBS for the control group. This figure shows that students who respond weakly to the relaxation training generally perform slightly lower in total CTBS scale scores than their control group which had no training. Possibly, the relaxation training reduces anxiety and thus reduces motivation to succeed on the CTBS. Six schools had mean wrist temperature increases which were small, less than 2.75°F. (1.53°C), and in all six cases the experimental group scored below the control group. For those classes in which the relaxation difference was 2.75°F. or greater, however, the experimental group scored higher than the control group in four out of five pairs of classes. These classes exhibited a substantial increase in observed difference scores on the CTBS.

The data suggest the existence of a curvilinear relationship between physiological response to relaxation training and performance on the CTBS. The nature of this relationship masks the overall difference between the experimental and control groups (as noted in Table 20), but Figure 6 allows a clearer understanding of the relationship between relaxation response and performance.

The CTBS reading subtest, language subtest, and math subtest each follow the same pattern as the total score. They indicate the existence of a *threshold* or minimum degree of relaxation necessary to produce changes in cognitive performance. At an approximate increase of 2.75°F (1.53°C) the data change. Classes, in which means are lower than 2.75°C, are characterized in each case by experimental groups which perform lower than the control group on the CTBS. When mean temperature increases exceed 2.75° the experimental group tends to outperform the control group. These results indicate that there is a threshold where relaxation training becomes effective. Participating in a relaxation program is apparently nonproductive if the skill is not learned well enough to produce large changes in physiological measures. When the skill is adequately learned, the data indicate that some cognitive gains can be achieved. This finding suggests that if relaxation training is

TABLE 20

INDEPENDENT T TESTS BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON CTBS SCALE SCORES

Subtest	Group	Mean	t value	Probability
Reading	Experimental	721.2	0.22	0.82
	Control	720.1		
Language	Experimental	699.9	0.24	0.81
	Control	698.8		
Math	Experimental	712.6	0.45	0.66
	Control	711.8		
Total	Experimental	711.7	0.35	0.73
	Control	710.4		

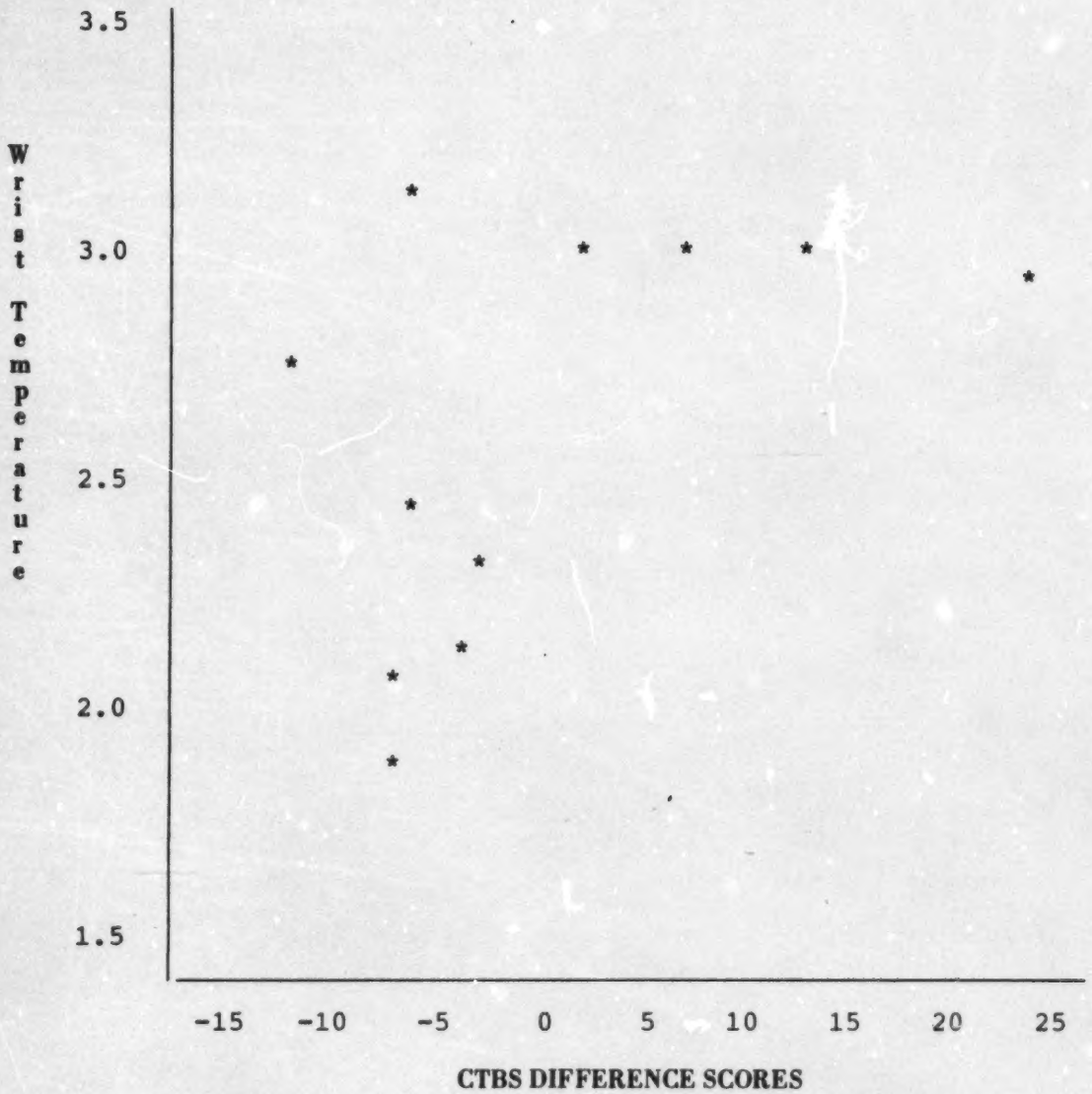

Fig. 6. Scatterplot of CTBS difference between experimental and control groups with difference from prereading to postreading wrist temperature.

pursued until the student has mastered the skill of eliciting the relaxation response, there may be significant gains in learning. This hypothesis demands further examination.

CONCLUSION

The study implemented a stress management program of relaxation exercises during homeroom or group guidance period at the beginning of the day. In middle schools the period is typically from 15 to 20 minutes in length, designed for the purpose of checking attendance and developing self-awareness, self-esteem, communication, and decision-making skills in children. Since the relaxation exercises were during homeroom or group guidance period, the school reported little disruption in school routine.

The regular classroom teacher provided the relaxation curriculum. Teachers received training in a three-day workshop before the program began in the school. Although the data suggest teacher differences in the 10 schools, the audio-taped exercises removed much of the dependency upon the personality and teaching skills of the teacher. Since the implementation plan was successful, the researcher recommends the plan to school administrators and counselors who anticipate implementing a stress management program.

Wrist temperature proved a good measure of the relaxation state. By taking pre and post temperature readings, the researcher measured the change in temperature, an indication of the development of the skill of eliciting the relaxation response at will. Although biofeedback is not necessary in teaching a program of relaxation, the researcher believes that children learn the skill better with monitors. Wrist or finger indicators are inexpensive so this kind of biofeedback holds promise for the implementation of relaxation programs in the schools. The study suggests using pre-post changes in wrist temperature rather than actual temperature values. Also, researchers should adjust wrist temperatures for ambient temperature fluctuations.

As a result of relaxation training, middle school rural children showed affective changes. Although the checklist completed by the content teachers showed no significant differences between the experimental and control groups, the experimental group had fewer discipline referrals to the office of the principal. Since the actions of teachers are more accurate than what teachers say, the *Walker Problem Behavior Identification Checklist* is questionable as an appropriate instrument for measuring differences in behavior. Another reason for the discrepancy may be that teachers completing an instrument in the quietness of the home or classroom after school tend to forget exact behaviors of children. The results from the discipline referrals agreed with previous research dealing with disruptive behaviors (Matthews, 1982b).

In addition to improving problem behavior, the rural girls improved their self-concept scores as a result of relaxation training. When compared to the control children, the experimental group had a higher mean on all subscales except teacher affiliation, although none of these differences were significant for the group as a whole. The procedure had a significant positive effect on self-acceptance, self-assertion, and peer affiliation, however, for the female students. Any improvement in self-concept is probably attributable to the positive self-messages children used in the relaxation program. When the individual is relaxed and mentally non-focused, attitudes are more susceptible to change. Denis Waitley (1983) recognized the power of relaxation and self-talk when he recommended the technique as one of the 10 seeds of greatness.

In previous research (Matthews, 1982b) the researcher found a significant difference in attendance between an experimental and control group while using relaxation training in a voluntary program in the summer. When attendance and tardiness showed no significant differences between the two groups, the researcher searched for reasons. After questioning the principals and counselors in the 10 schools, the researcher realized that the children had little control over their absences and tardies. Absenteeism and tardiness depended, in many cases, upon the parents, buses, and other environmental conditions. However, there is also the possibility that as the experimental children gained self-confidence and self-regulation they exercised more control over their life. In cases where children felt only slightly ill or disliked activities at school, they may have chosen to miss school. Should the theory be true, it would account for more absences in the experimental group than the control group A limitation of the study was not examining the reasons for absences.

The findings in cognitive behavior suggest more research. While no significant differences existed between the experimental and control groups on achievement scores, a curvilinear relationship appeared between physiological response to relaxation training and performance on the CTBS. The data indicate the existence of a threshold or minimum degree of relaxation necessary to produce changes in cognitive behavior. In the study the threshold was an increase in wrist temperature of at least 2.75^{o}F (1.53^{o}C) from pre to post readings. Should the tentative assumption prove to be true, educators could improve the achievement of children through relaxation training.

In summary, the study indicates that a stress management program could be implemented in schools on a large scale basis by the regular classroom teacher. As a result of relaxation training, the researcher noticed positive changes in problem behavior. Also, self-concept and achievement, while showing no overall experimental/control difference, appear to be positively affected by relaxation training for at least part of the population.

The study raises a number of questions which need empirical study. These include: What factors within the school are associated with ambient stress? What is the most efficient length of time for a relaxation training session? How frequently should one practice relaxation exercises? Which relaxation techniques are most effective? How does relaxation training affect locus of control, anxiety, creativity, attention span, social interaction skills, and general physical health? Answers to these and other questions are essential in building a cohesive theory of relaxation.

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APPENDIX A

CURRICULUM FOR FIRST SEMESTER

Date	Exercise
September 20	Holland - Exercise A - Breathing
September 21	Holland - Exercise B - Facial Muscles
September 22	Holland - Exercise C - Striate Muscles
September 23	Holland - Exercise D - Heaviness and Warmth
September 24	Holland - Exercise A - Breathing
September 27	Holland - Exercise B - Facial Muscles
September 28	Holland - Exercise C - Striate Muscles
September 29	Holland - Exercise D - Heaviness and Warmth
September 30	Charlesworth - Autogenic Relaxation - Part I
October 1	Charlesworth - Autogenic Relaxation - Part II
October 4	Matthews - Exercise 1 - Tense and Relaxed Muscles
October 5	Lupin - Children's Relaxation Exercises - I-3
October 6	Lupin - Children's Relaxation Exercises - I-4
October 7	Matthews - Exercise 2 - Suggestion
October 8	Matthews - Exercise 3 - Heaviness
October 11	Matthews - Exercise 4 - Breathing
October 12	Matthews - Exercise 5 - Alternative Breathing
October 13	Matthews - Exercise 6 - Warmth
October 14	Matthews - Exercise 7 - Solar Plexus
October 15	Matthews - Exercise 8 - Pain
October 18	Matthews - Exercise 9 - An Imaginary Trip
October 19	Matthews - Exercise 10 - Visual Imagery
October 20	Lupin - Trip to the Beach - I-5
October 21	Lupin - Yes I Can, I Know I Can - I-6
October 22	Lupin - Old Me, New Me - II-1
October 25	Lupin - Trip to a Star - II-2
October 26	Lupin - Walk in the Woods - II-3
October 27	Lupin - Trip to the Colorado Rockies - II-4
October 28	Lupin - The Secret Place - II-5
October 29	Lupin - Magic Mountain - II-6
November 1	Charlesworth - Autogenic Relaxation - Part I
November 2	Charlesworth - Autogenic Relaxation - Part II
November 3	Matthews - Exercise 2 - Suggestion
November 4	Matthews - Exercise 3 - Heaviness
November 5	Matthews - Exercise 4 - Breathing
November 8	Matthews - Exercise 5 - Alternative Breathing
November 9	Matthews - Exercise 6 - Warmth

November 10	Matthews - Exercise 7 - Solar Plexus
November 11	Matthews - Exercise 8 - Pain
November 12	Matthews - Exercise 9 - An Imaginary Trip
November 15	Matthews - Exercise 10 - Visual Imagery
November 16	Lupin - Trip to the Beach - I-5
November 17	Lupin - Yes I Can, I Know I Can - I-6
November 18	Lupin - Old Me, New Me - II-1
November 19	Lupin - Trip to a Star - II-2
November 22	Lupin - Walk in the Woods - II-3
November 23	Lupin - Trip to the Colorado Rockies - II-4
November 24	Lupin - The Secret Place - II-5
November 29	Lupin - Magic Mountain - II-6
November 30	Charlesworth - Autogenic Relaxation - Part I
December 1	Charlesworth - Autogenic Relaxation - Part II
December 2	Matthews - Exercise 4 - Breathing
December 3	Matthews - Exercise 5 - Alternative Breathing
December 6	Matthews - Exercise 6 - Warmth
December 7	Matthews - Exercise 7 - Solar Plexus
December 8	Matthews - Exercise 8 - Pain
December 9	Matthews - Exercise 9 - An Imaginary Trip
December 10	Matthews - Exercise 10 - Visual Imagery

Curriculum for Second Semester

January 3	Lupin - Children's Relaxation Exercises - I-3
January 4	Lupin - Children's Relaxation Exercises - I-4
January 5	Lupin - Trip to the Beach - I-5
January 6	Lupin - Yes I Can, I Know I Can - I-6
January 7	Matthews - Exercise 3 - Heaviness
January 10	Matthews - Exercise 4 - Breathing
January 11	Matthews - Exercise 5 - Alternative Breathing
January 12	Matthews - Exercise 6 - Warmth
January 13	Matthews - Exercise 7 - Solar Plexus
January 14	Matthews - Exercise 8 - Pain
January 17	Matthews - Exercise 9 - An Imaginary Trip
January 18	Matthews - Exercise 10 - Visual Imagery
January 19	Charlesworth - Autogenic Relaxation
January 20	Lupin - Old Me, New Me - II-1
January 21	Lupin - Trip to a Star - II-2
January 24	Lupin - Walk in the Woods - II-3
January 25	Lupin - Trip to the Colorado Rockies - II-4
January 26	Lupin - The Secret Place - II-5
January 27	Lupin - Magic Mountain - II-6
January 28	Holland - Exercise C - Striate Muscles
January 31	Holland - Exercise D - Heaviness and Warmth

February 1	Holland - Exercise E - Combined Imagery
February 2	Lupin - Children's Relaxation Exercises - I-3
February 3	Lupin - Children's Relaxation Exercises - I-4
February 4	Lupin - Trip to the Beach - I-5
February 7	Lupin - Yes I Can, I Know I Can - I-6
February 8	Matthews - Exercise 3 - Heaviness
Febryary 9	Matthews - Exercise 4 - Breathing
February 10	Matthews - Exercise 5 - Alternative Breathing
February 11	Matthews - Exercise 6 - Warmth
February 14	Matthews - Exercise 7 - Solar Plexus
February 15	Matthews - Exercise 8 - Pain
February 16	Matthews - Exercise 9 - An Imaginary Trip
February 17	Matthews - Exercise 10 - Visual Imagery
February 18	Charlesworth - Autogenic Relaxation
February 21	Lupin - Old Me, New Me - II-1
February 22	Lupin - Trip to a Star - II-2
February 23	Lupin - Walk in the Woods - II-3
February 24	Lupin - Trip to the Colorado Rockies - II-4
February 25	Lupin - The Secret Place - II-5
February 28	Lupin - Magic Mountain - II-6
March 1	Holland - Exercise C - Striate Muscles
March 2	Holland - Exercise D - Heaviness and Warmth
March 3	Holland - Exercise E - Combined Imagery
March 4	Lupin - Children's Relaxation Exercises - I-3
March 7	Lupin - Children's Relaxation Exercises - I-4
March 8	Lupin - Trip to the Beach - I-5
March 9	Lupin - Yes I Can, I Know I Can - I-6
March 10	Matthews - Exercise 3 - Heaviness
March 11	Matthews - Exercise 4 - Breathing
March 14	Matthews - Exercise 5 - Alternative Breathing
March 15	Matthews - Exercise 6 - Warmth
March 16	Matthews - Exercise 7 - Solar Plexus
March 17	Matthews - Exercise 8 - Pain
March 18	Matthews - Exercise 9 - An Imaginary Trip
March 21	Matthews - Exercise 10 - Visual Imagery
March 22	Charlesworth - Autogenic Relaxation
March 23	Lupin - Old Me, New Me - II-1
March 24	Lupin - Trip to a Star - II-2
March 25	Lupin - Walk in the Woods - II-3
March 28	Lupin - Trip to the Colorado Rockies - II-4
March 29	Lupin - The Secret Place - II-5
March 30	Lupin - Magic Mountain - II-6
March 31	Holland - Exercise C - Striate Muscles
April 1	Holland - Exercise D - Heaviness and Warmth
April 4	Holland - Exercise E - Combined Imagery

April 5	Lupin - Children's Relaxation Exercises - I-3
April 6	Lupin - Children's Relaxation Exercises - I-4
April 7	Lupin - Trip to the Beach - I-5
April 8	Lupin - Yes I Can, I Know I Can - I-6
April 11	Matthews - Exercise 3 - Heaviness
April 12	Matthews - Exercise 4 - Breathing
April 13	Matthews - Exercise 5 - Alternative Breathing
April 14	Matthews - Exercise 6 - Warmth
April 15	Matthews - Exercise 7 - Solar Plexus
April 18	Matthews - Exercise 8 - Pain
April 19	Matthews - Exercise 9 - An Imaginary Trip
April 20	Matthews - Exercise 10 - Visual Imagery
April 21	Charlesworth - Autogenic Relaxation
April 22	Lupin - Old Me, New Me - II-1
April 25	Lupin - Trip to a Star - II-2
April 26	Lupin - Walk in the Woods - II-3
April 27	Lupin - Trip to the Colorado Rockies - II-4
April 28	Lupin - The Secret Place - II-5
April 29	Lupin - Magic Mountain - II-6

APPENDIX B

Teacher Questionnaire

The following statements concern the design and implementation of Project Relaxation. Your frank responses will be most useful to the ongoing success of the project. Please respond to each statement according to the following scale:

1 - I strongly agree.
2 - I agree.
3 - I am undecided.
4 - I disagree.
5 - I strongly disagree.

____ 1. The students react to Project Relaxation with enthusiasm.

____ 2. The students lose interest in relaxation training over time.

____ 3. The students look forward to their daily relaxation exercises.

____ 4. Negative changes are apparent in the students as the project progresses (i.e. more aggressive behavior, less self-control).

____ 5. The students seem to carry their new relaxation training techniques beyond the classroom into their larger environment.

____ 6. The students' parents express support for the relaxation training program.

____ 7. The students are adept at using their wrist temperature bands and are careful to take accurate readings.

____ 8. Stress management training is a skill which can help individuals throughout their lives.

____ 9. Learning to elicit the relaxation response at will is a worthwhile technique to acquire.

____ 10. Having the relaxation training first thing in the morning is an inappropriate time slot and should be changed.

____ 11. Practicing relaxation training every day is important.

____ 12. Relaxation training disrupts the morning routine.

____ 13. Teacher participation in the project is essential for its success.

____ 14. Stress management is important enough to be included as the fourth "R" in the school curriculum.

____ 15. The summer orientation workshop prepares trainers adequately to carry out the relaxation exercises in classrooms.

____ 16. The Instructor's Manual provides valuable information for implementing a relaxation program.

____ 17. The trainers need more adequate guidance throughout the relaxation training program than the project leaders provide.

____ 18. The school coordinator visits the classrooms more frequently than is necessary.

____ 19. The GSR^2 biofeedback instrument is a worthwhile additional treatment for the students' physiological awareness of stress levels.

____ 20. The school coordinator provides a positive model for the students during visits to the classroom.

____ 21 Audio tapes seem to be a poor means of teaching relaxation.

____ 22. Project Relaxation's audio tapes compare favorable with commercial exercises.

Please use the space below to make any additional observations or suggestions about Project Relaxation. Thank you.

APPENDIX C

Student Questionnaire

The following statements concern Project Relaxation. Please decide how you feel about each statement and answer one of the following:

1 - I strongly agree.
2 - I agree.
3 - I am undecided.
4 - I disagree.
5 - I strongly disagree.

____ 1. Stress management is a skill which helps people throughout their lives.

____ 2. Learning to relax at will is an important skill to have.

____ 3. Relaxation training makes it difficult to concentrate on schoolwork.

____ 4. Relaxation exercises makes me feel less "uptight" when taking a test.

____ 5. Relaxation exercises help in dealing with stress at home.

____ 6. Practicing relaxation techniques before going to bed at night helps me to sleep better.

____ 7. Relaxation techniques can only be used at school with biofeedback equipment or tapes.

____ 8. Learning stress management makes me feel better about myself.

____ 9. Relaxation training helps to distinguish between tension and relaxation in the body.

____ 10. Practicing relaxation training every day is important.

____ 11. Practicing relaxation exercises is a good way to become calm.

____ 12. The relaxation exercises interrupt the normal morning routine.

____ 13. The taped relaxation exercises help me to use my imagination.

____ 14. Opening my eyes during the relaxation tapes helps in concentrating on the exercises.

____ 15. Using the GSR[2] biofeedback unit makes me more aware of how my body reacts to stress.

____ 16. Most of the students in my class hate doing the morning relaxation exercises.

____ 17. Relaxation exercises make the students more tense and excited in the classroom.

____ 18. The stress management program makes the students more in control of their own behavior.

____ 19. The school coordinator visits the classroom too often.

____ 20. The classroom teacher provides a good example of how to do relaxation exercises.

____ 21. The classroom teacher is enthusiastic about doing the relaxation exercises with the students.

____ 22. The school coordinator provides a good example of how to relax.